

CLAIMS

What is claimed is:

- 1 1. A method for pre-distorting an input signal, comprising:
 - 2 generating, based on the input signal, a first signal corresponding to a first portion of a first transfer function;
 - 4 generating, based on the input signal, a second signal corresponding to a second portion of the first transfer function;
 - 6 combining the first and second signals to generate a first combined signal corresponding to the first transfer function; and
 - 8 pre-distorting the input signal based on the first combined signal.

- 1 2. The invention of claim 1, wherein:
2 the first transfer function corresponds to amplitude characteristics of an amplifier; and
3 the amplitude of the input signal is adjusted based on the first combined signal.

- 1 3. The invention of claim 1, wherein:
2 the first transfer function corresponds to phase characteristics of an amplifier; and
3 the phase of the input signal is adjusted based on the first combined signal.

- 1 4. The invention of claim 3, further comprising:
 - 2 generating, based on the input signal, a third signal corresponding to a first portion of a second transfer function corresponding to amplitude characteristics of the amplifier;
 - 4 generating, based on the input signal, a fourth signal corresponding to a second portion of the second transfer function;
 - 6 combining the third and fourth signals to generate a second combined signal corresponding to the second transfer function; and
 - 8 adjusting the amplitude of the input signal based on the second combined signal.

- 1 5. The invention of claim 4, further comprising detecting the envelope of the input signal, wherein:
2 the first and second signals are generated based on the envelope-detected input signal;
3 the first signal is generated by DC-shifting the envelope-detected input signal; and
4 the first and second signals are generated using different non-linear analog circuits that model
5 different portions of the first transfer function.

1 6. The invention of claim 1, further comprising detecting the envelope of the input signal, wherein
2 the first and second signals are generated based on the envelope-detected input signal.

1 7. The invention of claim 6, wherein the first signal is generated by DC-shifting the envelope-
2 detected input signal.

1 8. The invention of claim 1, wherein the first and second signals are generated using different non-
2 linear analog circuits that model different portions of the first transfer function.

1 9. The invention of claim 1, further comprising:
2 differentiating a first portion of the first combined signal to generate a differentiated signal; and
3 combining the differentiated signal with a second portion of the first combined signal to generate a
4 frequency-dependent combined signal, wherein the input signal is pre-distorted based on the frequency-
5 dependent combined signal.

1 10. The invention of claim 1, further comprising:
2 generating a frequency-dependent pre-distortion signal; and
3 combining the frequency-dependent pre-distortion signal with the first combined signal to generate a
4 frequency-dependent combined signal, wherein the input signal is pre-distorted based on the frequency-
5 dependent combined signal.

1 11. An apparatus for pre-distorting an input signal, comprising:
2 means for generating, based on the input signal, a first signal corresponding to a first portion of a first
3 transfer function;
4 means for generating, based on the input signal, a second signal corresponding to a second portion of
5 the first transfer function;
6 means for combining the first and second signals to generate a first combined signal corresponding to
7 the first transfer function; and
8 means for pre-distorting the input signal based on the first combined signal.

1 12. The invention of claim 11, wherein:
2 the first transfer function corresponds to amplitude characteristics of an amplifier; and
3 the amplitude of the input signal is adjusted based on the first combined signal.

1 13. The invention of claim 11, wherein:
2 the first transfer function corresponds to phase characteristics of an amplifier; and
3 the phase of the input signal is adjusted based on the first combined signal.

1 14. The invention of claim 13, further comprising:
2 means for generating, based on the input signal, a third signal corresponding to a first portion of a
3 second transfer function corresponding to amplitude characteristics of the amplifier;
4 means for generating, based on the input signal, a fourth signal corresponding to a second portion of
5 the second transfer function;
6 means for combining the third and fourth signals to generate a second combined signal corresponding
7 to the second transfer function; and
8 means for adjusting the amplitude of the input signal based on the second combined signal.

1 15. An apparatus for pre-distorting an input signal, comprising:
2 a main signal path comprising a first element adapted to pre-distort the input signal based on a first
3 control signal; and
4 a control signal path adapted to generate the first control signal and comprising:
5 an envelope detector adapted to detect the envelope of the input signal;
6 a DC-level-shifting circuit adapted to DC-shift a first copy of the envelope-detected input signal;
7 a first non-linear circuit adapted to generate, based on the DC-shifted, envelope-detected input
8 signal, a first signal corresponding to a first portion of a first transfer function;
9 a second non-linear circuit adapted to generate, based on a second copy of the envelope-detected
10 input signal, a second signal corresponding to a second portion of the first transfer function; and
11 a first combiner adapted to combine the first and second signals to generate a first combined
12 signal corresponding to the first transfer function, wherein the first control signal is based on the first
13 combined signal.

1 16. The invention of claim 15, wherein:
2 the first transfer function corresponds to amplitude characteristics of an amplifier; and
3 the first element is an attenuator adapted to adjust the amplitude of the input signal based on the first
4 control signal.

1 17. The invention of claim 15, wherein:
2 the first transfer function corresponds to phase characteristics of an amplifier; and

3 the first element is a phase adjuster adapted to adjust the phase of the input signal based on the first
4 control signal.

1 18. The invention of claim 17, wherein:

2 the main signal path further comprises an attenuator adapted to adjust the amplitude of the input
3 signal based on a second control signal; and

4 the control signal path is further adapted to generate the second control signal and further comprises:

5 a third non-linear circuit adapted to generate, based on the DC-shifted, envelope-detected input
6 signal, a third signal corresponding to a first portion of a second transfer function corresponding to
7 amplitude characteristics of the amplifier;

8 a fourth non-linear circuit adapted to generate, based on the envelope-detected input signal, a
9 fourth signal corresponding to a second portion of the second transfer function; and

10 a second combiner adapted to combine the third and fourth signals to generate a second
11 combined signal corresponding to the second transfer function, wherein the second control signal is
12 based on the second combined signal.

1 19. The invention of claim 18, wherein the first and second non-linear circuits are analog circuits.

1 20. The invention of claim 15, wherein the first and second non-linear circuits are analog circuits.

1 21. The invention of claim 15, wherein the control signal path further comprises:

2 a differentiator adapted to differentiate a first portion of the first combined signal to generate a
3 differentiated signal; and

4 a second combiner adapted to combine the differentiated signal with a second portion of the first
5 combined signal to generate a frequency-dependent combined signal, wherein the first control signal is
6 based on the frequency-dependent combined signal.

1 22. The invention of claim 15, further comprising:

2 an additional set of circuitry adapted to generate a frequency-dependent pre-distortion signal; and

3 a second combiner adapted to combine the frequency-dependent pre-distortion signal with the first
4 combined signal to generate a frequency-dependent combined signal, wherein the first control signal is
5 based on the frequency-dependent combined signal.